PATENT SPECIFICATION
DRAWINGS ATTACHED

1,001,153

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Int. Cl.:—F 04 d

COMPLETE SPECIFICATION

Improvements relating to Rotors for Flow Machines

We, FIRTH CLEVELAND LIMITED, a British Company, of Stornoway House, Cleveland Row, St. James's, London, S.W.1., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to rotors for flow machines of the cross-flow kind. Flow machines of this kind include a cylindrical bladed rotor and guide means extending along the rotor to guide flow twice through the blades of the rotor in a direction transverse to the rotor axis. Examples of flow machines having the characteristics set forth may be found in British patent specification No. 876,611 (Application No. 20871/57).

It should be noticed that there is no theoretical limit to the length of the rotor of a cross-flow machine. A main object of this invention is to facilitate the production of rotors using moulded components.

The invention accordingly provides a cross-flow rotor comprising at least two axially aligned interconnected moulded components, each component having a support member of circular periphery and a series of blades moulded integrally with and extending from said support member parallel to the rotor axis and in a ring thereabout, and an additional support member of circular periphery, the ends of the blades of at least one component remote from the support member thereof being interengaged with another of said support members, the last mentioned support member having, in the completed rotor, blades extending from that member to opposite sides thereof with the blades on one side in staggered relationship with the blades on the other side.

A rotor according to the invention may consist of more than two components. Individual components may be designed for convenience in moulding and a rotor of desired length built up of two or more such components. The components may be identical; in this way rotors of various lengths may be made up from different numbers of the one component, thereby permitting economic manufacture with minimum tooling costs. In such a rotor, at least two components are aligned with their blades projecting in the same sense to one side only of the respective support member, the blades of one component engaging in the support member of the next component and the blades of the component remote from said one component engaging said additional support member. However an end component may be different from the other or others in some respects, *e.g.* by including drive connecting means. The invention also envisages a rotor wherein two components have their blades directed toward one another from their support members and interengaged with said additional support member from opposite sides thereof and in staggered relationship. The additional support member may be simply a disc which, if it is placed at the end of the rotor, may include means for mounting the rotor for rotation. The parts of the rotor may be designed to be push-fitted together, and secured by adhesive if desired.

The invention will be further described with reference to the accompanying diagrammatic drawings in which:—

Figure 1*a*, 1*c* and 1*d* show three forms of rotor component, which can be used to build up rotors according to the invention, all these views being in sections containing the rotor axis, the Figure 1*a* section being taken on the line VIIa—VIIa of Figure 2;

Figure 1*b* shows a member for connecting rotor components *e.g.* as shown in Figures 1*a* and 1*c*, and Figure 1*e* shows an end disc for a rotor comprising *e.g.*, components as shown

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in Figure 1*d*, Figures 1*b* and 1*e* being also axial sectional views;

Figure 2 is a section taken transversely of the rotor comprising the motor components of Figures 1*a* and 1*c* connected by the member of Figure 1*b*, the section being taken on the line VIII—VIII of Figure 1*a*;

Figure 3 is a partial perspective view also illustrating the connection of rotor components by the member of Figure 1*b*, and

Figures 4 to 7 are diagrams illustrating certain flow machines incorporating rotors constructed from components such as illustrated in earlier figures.

Referring to the drawings Figure 1*a* shows a rotor component 31 comprising an end disc 30 with which blades 32 are cast integrally to extend in a ring at right angles to the disc. A boss 100 provides means for mounting the end disc 30 on a shaft, and an annular weakened area 31^1 around the boss permits flexing on rotation, due to minor misalignment between the shaft and the rotor axis. This component as indeed also the others herein described may be injection—moulded from plastics material. The section plane of Figure 1*a* is indicated in Figure 2, the blade 32*a* drawn at the top being sectioned, whereas the blade 32 drawn at the bottom appears as seen in elevation. The blade 32 is formed integrally with pegs 33 at their free ends which fit into recesses 34 formed in a disc 35 illustrated in Figure 1*b*. The disc 35 may be replaced by a ring. The disc 35 is formed adjacent its periphery with twice as many recesses as there are blades in the component 31. It is therefore possible to construct a rotor by fitting together two rotor components as shown in Figure 1*a* (assumed of left hand and right hand character) by means of a disc 35 (or equivalent ring), the two components being inserted into the plate 35 with a displacement relative to each other which amounts to half the spacing between two blades in the peripheral direction.

Figures 2 and 3 show the manner in which said assembly is performed. The pegs 33 are inserted into the recesses 34 and glued therein. The pegs 33^1 of the adjacent component are inserted into the recesses 34 disposed between the recesses receiving the blades 32 and 32*a*. Thus in the completed rotor, blades 32 extend to opposite sides of the disc 35, with the blades on one side in staggered relationship with the blades on the other side.

Figure 1*c* illustrates a rotor component 37 wherein blades 38 and 38^1 are cast integrally with an intermediate disc 36 and extend in a ring from either side thereof and perpendicularly thereto. The free ends of the blades carry pegs 31^1, 33^{11}.

Figure 1*d* illustrates a rotor component 40 wherein a ring of blades 41 is cast integrally with an end disc 42. Recesses 43 into which the pegs of an additional rotor component may be inserted are in each instance disposed between two blades 41 in the disc 42.

Figure 1*e* illustrates an end disc 44 which also exhibits recesses 45 into which pegs 33^{111} may be inserted. The end disc has a weakened annular area 46 around a boss 47; the boss 47 can be mounted on a shaft and the weakened area permits flexing on rotation, due to minor misalignment between the shaft and the rotor axis.

As above mentioned, a rotor can be constructed by assembling two components 31 (Figure 1*a*) of left and right hand character by means of a disc 35 (Figure 1*b*), the pegs 33 on the free ends of the blades 32 entering the holes 34 from opposite sides. Components 40 (Figure 1*d*) may be similarly joined. Identical components 37 (Figure 1*c*) can also be joined end to end by disc 35. Identical components 40 can be joined end to end, the pegs 33^{111} on the first component entering the recesses 43 of the second and so on. A rotor may be constructed by connecting components 31, disc 35, component 37, component 40 and disc 44, in the sequence shown. It will be evident to the reader that the components illustrated in Figures 1*a* to 1*e* need not necessarily be fitted together in the sequence shown. As mentioned, a rotor may for example be assembled from two components 31 and an intermediate disc 35. A component 31 and an arbitrary number of components 40 may be strung together and finally be closed off with an end plate. It is equally possible to utilise a component 31 at each extremity of a rotor and to extend the rotor by means of components 37 at will with the interposition of intermediate discs 35.

Figures 4 to 7 diagrammatically illustrate various possibilities of combining components according to the invention.

Figure 4 illustrates a combination 53 comprising three rotor components coupled to a motor M at one end.

Figure 5 shows a motor M driving a single-component rotor 54 and also a two-component rotor 55. This arrangement provides two separate and different throughput volumes. The rotors are coaxially driven at opposite ends of the motor shaft.

If pressures of different magnitude are required in two separate flows, single or multiple rotor units 56 and 57 having different diameters may be disposed to the right and left of a motor M, as shown in Figure 6.

Figure 7 illustrates a blower providing two separate flows and a motor M drives two similar 4-component rotors 58, 59, at opposite ends of the motor shaft.

WHAT WE CLAIM IS:—

1. A cross-flow rotor comprising at least two axially aligned interconnected moulded components, each component having a support member of circular periphery and a series

of blades moulded integrally with and extending from said support member parallel to the rotor axis and in a ring thereabout, and an additional support member of circular periphery, the ends of the blades of at least one component remote from the support member thereof being interengaged with another of said support members, the last mentioned support member having, in the completed rotor, blades extending from that member to opposite sides thereof with the blades on one side in staggered relationship with the blades on the other side.

2. A rotor as claimed in Claim 1, wherein the blades terminate in pegs received in holes in the support member.

3. A rotor as claimed in Claim 1 or Claim 2, wherein at least one support member is a disc and carries means for connection with a drive shaft.

4. A rotor as claimed in Claim 3, wherein the connection means is a central boss adapted to fit on the end of a drive shaft.

5. A rotor as claimed in Claim 3 or Claim 4, wherein the disc has an annular weakened portion around the connection means to permit flexing on rotation due to minor misalignment between the shaft and the rotor axis.

6. A rotor as claimed in any of Claims 1 to 5, wherein at least one support member is a ring.

7. A rotor as claimed in any of Claims 1 to 6, wherein two components have their blades directed toward one another from their support members and interengaged with said additional support member from opposite sides thereof and in staggered relationship.

8. A rotor as claimed in Claim 7, wherein at least one of said components has blades extending to either side of the support member therefor.

9. A rotor as claimed in any of Claims 1 to 6, wherein at least two components are aligned with their blades projecting in the same sense to one side only of the respective support member, the blades of one component engaging in the support member of the next component and the blades of the component remote from said one component engaging said additional support member.

10. A rotor as claimed in Claim 9, wherein at least said two components are identical.

11. The several forms of cross-flow rotor herein described with reference to the accompanying drawings.

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Sheet 1

FIG. 1a. FIG. 1b. FIG. 1c.

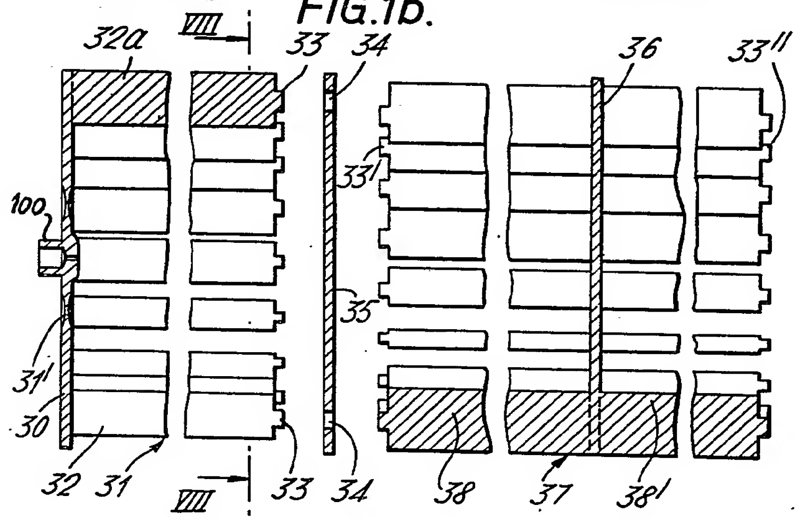


FIG. 1d. FIG. 1e.

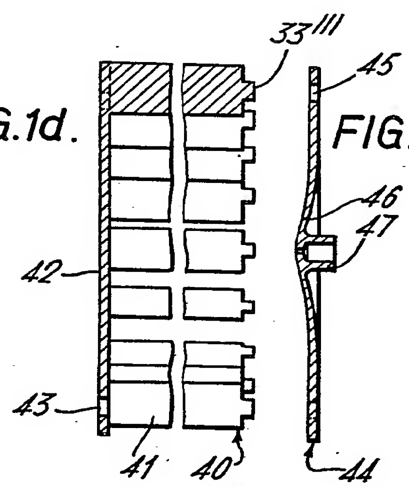


FIG.2.

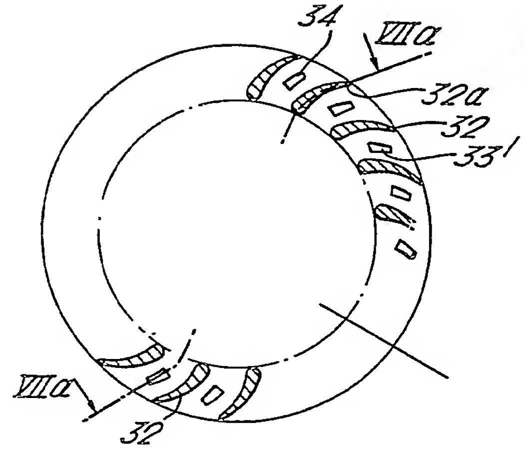


FIG.3.

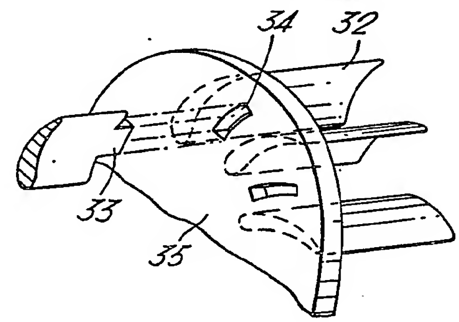
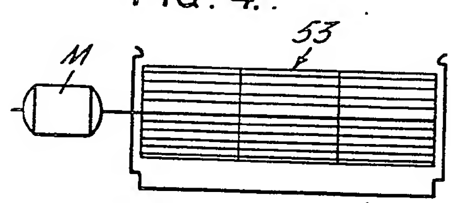


FIG. 4.



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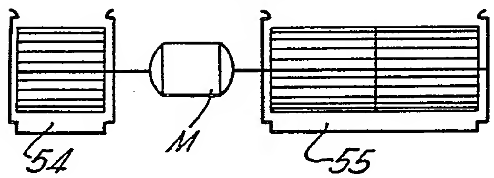
2.

FIG. 5.



G.3.

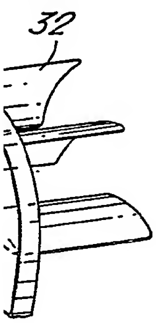


FIG. 6.

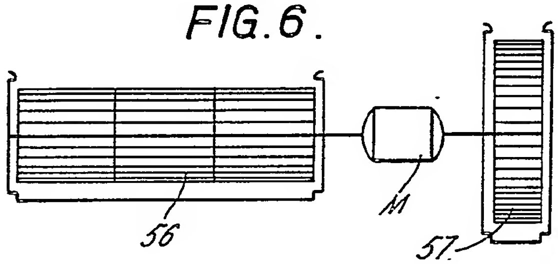
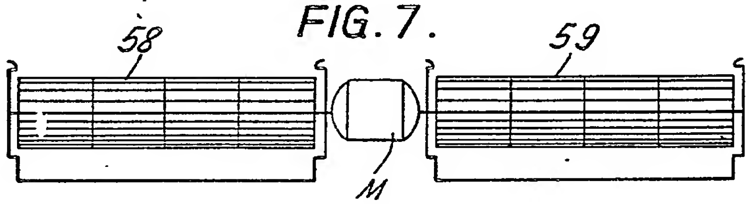


FIG. 7.



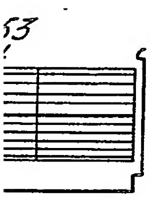


FIG.2.

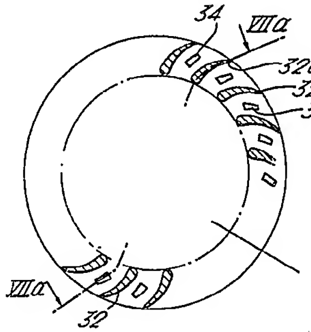


FIG.3.

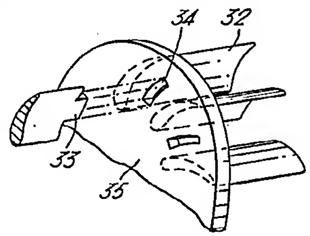


FIG.4.

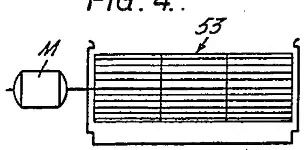


FIG.5.

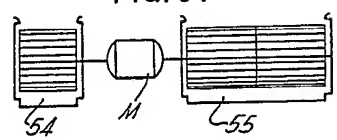


FIG.6.

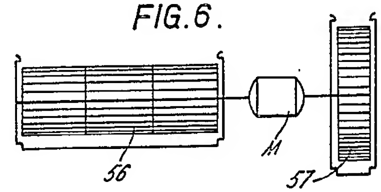


FIG.7.